

ALASKA

FEDERAL AID IN FISH RESTORATION
STUDY G-1

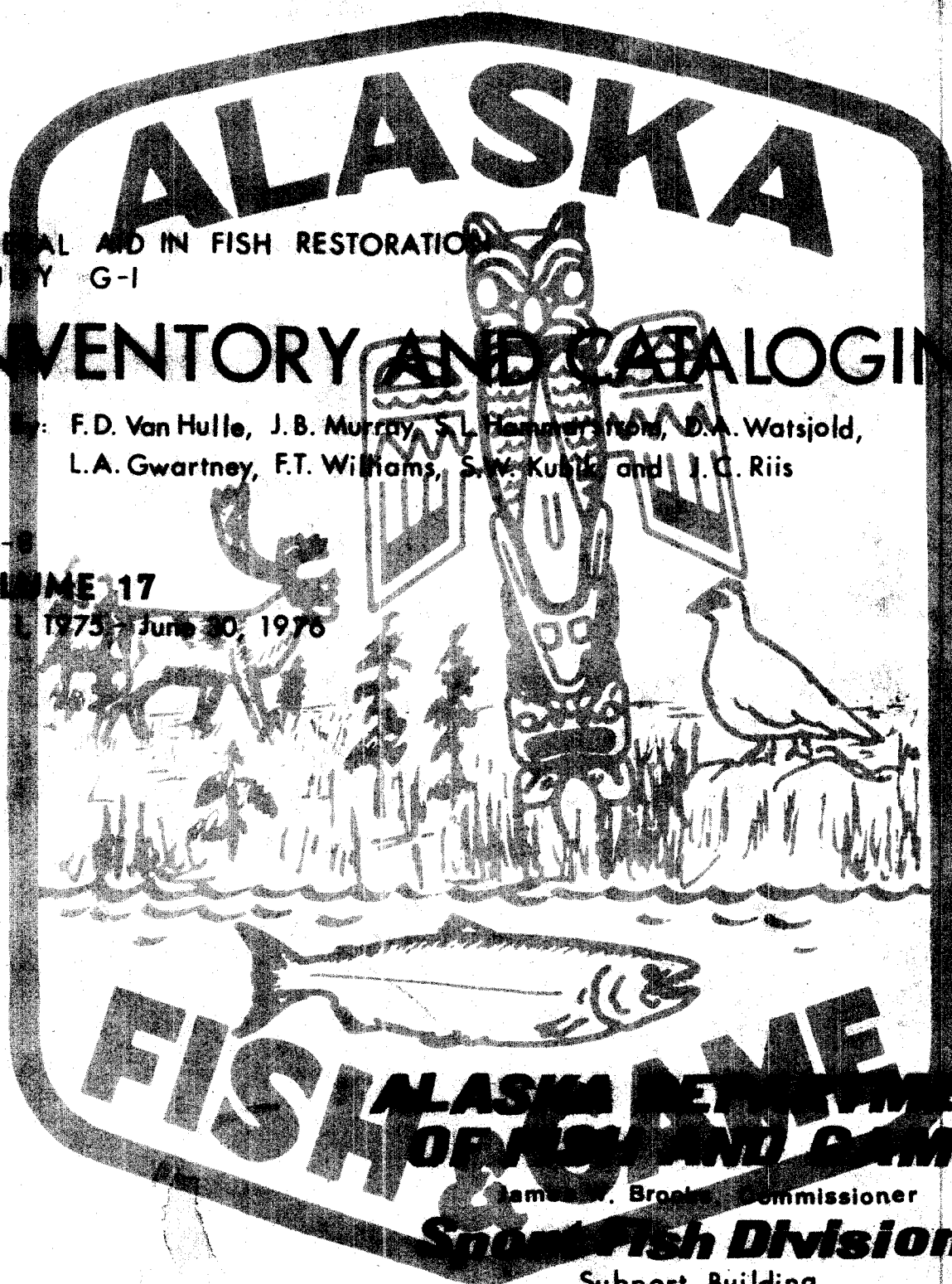
INVENTORY AND CATALOGING

By: F.D. Van Hulle, J.B. Murray, S.L. Hammarstrom, D.A. Watsjold,
L.A. Gwartney, F.T. Williams, S.W. Kulik and J.C. Riis

F-9-B

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James W. Brooks, Commissioner

Sport Fish Division

Support Building
JUNEAU, ALASKA

STATE OF ALASKA

Jay S. Hammond, Governor



Annual Performance Report for

INVENTORY AND CATALOGING

by

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RESEARCH PROJECT SEGMENT

State: ALASKA

Name: Sport Fish Investigations
of Alaska.

Project No.: F-9-8

Study No.: G-I

Study Title: INVENTORY AND CATALOGING

Job No.: G-I-B

Job Title: Inventory and Cataloging
of the Sport Fish and Sport
Fish Waters in Southwestern
Alaska.

Period Covered: July 1, 1975 to June 30, 1976.

ABSTRACT

Volumetric surveys of Pony and Tanignak lakes indicated surface areas of 14.4 and 29.5 acres, and volumes of 92 and 311 acre feet, respectively. Excellent growth and survival of rainbow trout, Salmo gairdneri (Richardson) was noted in Tanignak Lake, while Pony Lake exhibited poor coho salmon, Oncorhynchus kisutch, (Walbaum) growth and survival.

Foot surveys of 25 streams located on Shuyak Island indicated that five streams contained anadromous fish and should be included in the anadromous fish stream catalog.

Waters within or near logging operations on Afognak Island were surveyed and recommendations were made to protect existing fish populations.

Twenty-seven managed lakes in the Kodiak area were sampled with variable mesh gill nets to assess survival and growth trends of rainbow trout, coho salmon, Arctic grayling, Thymallus arcticus, (Pallas) and Dolly Varden, Salvelinus malma (Walbaum).

Rainbow trout from Ennis, Montana (150/lb.) and Winthrop, Washington (1,449/lb.) stocked June 20, 1974 in Margaret Lake (rehabilitated October, 1972) averaged 152 and 148 mm, respectively, after 14 months of residency. The catch per net hour was 2.9 times greater for the Winthrop trout,

suggesting no appreciable advantage in stocking rehabilitated waters with large fry. Similar growth was observed for Winthrop trout concurrently stocked in Lake Genevieve (rehabilitated October, 1972). Pony, Caroline, and Mayflower lakes were found to be extremely poor fish producers as few fish were captured per net hour of sampling.

Salmon escapement counts indicated approximately 193,320 pink salmon, O. gorbuscha (Walbaum), 12,150 chum salmon, O. keta (Walbaum), 4,207 sockeye salmon, O. nerka (Walbaum), and 5,820 cohos spawned in 20 northeast Kodiak Island streams.

Karluk and Ayakulik rivers had escapements of 1,050 and 2,000 chinook salmon, O. tshawytscha (Walbaum), respectively.

Data on rainbow trout (n=242) captured by a five panel variable mesh gill net, indicated age 0, III and IV+ trout were captured by 1/2, 1 1/2, and 2-inch mesh panels, respectively. Age I and II fish were captured by both the 3/4 and 1-inch mesh panels.

Gabion structures were installed in both Island Lake Creek and a tributary of Lake Rose Tead to enhance anadromous fish populations.

An experimental coho plant (3,700 at 518/lb.) in Mission Lake, June 27, 1973, produced an active sport fishery and a minimum of 35 adult spawners during September-October, 1975.

Monthly water analysis conducted on seven Kodiak Island lakes indicated all waters were low in productivity; however, sufficient dissolved oxygen was present to sustain fish life throughout the year.

BACKGROUND

The primary objective of Sport Fish Division projects in the Kodiak area is to optimize the survival and growth of resident and stocked game fish and to maintain the natural runs of anadromous fish.

The Kodiak management area is composed of the Kodiak-Afognak Island group and the Alaska Peninsula, south of a line from Cape Douglas to Port Heiden, including the Aleutian Islands. The Kodiak Island complex is approximately 125 miles long by 75 miles wide and the Alaska Peninsula section is 1,000 miles long extending 500 miles into the Bering Sea. The area is mountainous, with numerous bays, lakes, and streams, containing anadromous and resident fish. Much of the area has not been surveyed and the total number of fish producing waters is unknown. Kodiak Island has over 1,000 miles of coastline, over 1,000 lakes (10 acres or larger in size), and 227 anadromous fish streams.

The fish stocking program was initiated in 1953 and has continued to the present; however, in order to develop more successful programs, numerous lakes have been chemically rehabilitated and various species of fish have been stocked at differential rates, sizes, and under varied conditions to optimize growth and survival.

The physical and biological condition of lakes on northeast Kodiak Island have been examined in some detail and the results of these observations are shown in the annual Federal Aid in Fish Restoration Report 1953-1975. Priorities for research, stocking, and general survey work have been confined to the areas of intensive sport fishing effort or to areas where specific data is required to evaluate anticipated land use programs or development activities.

Stream research has centered on waters with unique species (such as steelhead, Salmo gairdneri (Richardson), rainbow trout, and chinook salmon) and on 20 major streams on northeast Kodiak Island.

The Federal Aid in Fish Restoration Report for the Kodiak area from 1953 to the present depicts specific data concerning the size, age, and growth of coho, Dolly Varden, chinook, sockeye, and steelhead from the Kodiak area. Additional data concerning harvest rates and spawning escapement are presented.

These data form the foundation for most management decisions concerning sport fish regulations and land use activities. They also determine in part the direction of Kodiak research projects by indicating specific areas for which data are lacking or where more comprehensive data are required.

RECOMMENDATIONS

1. Continue creel census on Buskin and Pasagshak rivers as needed.
2. Continue the postal survey annually.
3. Survey and catalog the fish producing waters on Afognak Island that may be affected by logging.
4. Evaluate the survival, growth, and quality of fishing produced by various races and species of stocked fish.
5. Determine the optimum coho carrying capacity of major streams on northeastern Kodiak Island.
6. Rehabilitate Pony Lake with Pro-Nox-fish at 0.5 ppm, 1976.

OBJECTIVES

1. To determine the physical, chemical and biological characteristics of existing and potential sport fishing streams and lakes in the Kodiak area.
2. To establish magnitude, distribution, timing, yearly fluctuations and angler harvest of sport fish populations on Kodiak Island, Afognak Island, and areas of concern to sport fisheries management on the Alaska Peninsula.

3. To evaluate and develop plans for the enhancement of anadromous and resident fish stocks.
4. To assist as required in the investigation of public access status to the area's sport fishing waters and make specific recommendations for public access sites.

TECHNIQUES USED

Standard techniques as described by Murray and Van Hulle (1975) were used in lake surveys, gillnet sampling, age analysis, determination of fish size and escapements, and water chemistry analysis. Water samples were also analyzed by the United States Geological Survey Laboratory in Anchorage, Alaska.

The catch trend of various net panels in a variable mesh gill net was examined by comparing mean length, standard deviation, catch frequencies, and age classes of fishes captured.

A creel census was conducted on Buskin River from April 22-October 19, 1975. Census interviews were conducted during four-hour periods, once each weekend day and twice during weekdays. The sampling design was set up in two-week periods with random four-hour blocks selected without replacement.

Angler interviews were conducted at Commercial Fish Division counting weirs to gain angler harvest information and effort on Karluk River, Akalura Creek, Olga Creek, and Ayakulik River.

The fall postal questionnaire (Figure 1) described by Murray and Van Hulle (1975) was expanded to include halibut, chinook, and steelhead.

In cooperation with Commercial Fish Division, a weir and support facilities were constructed on Karluk River approximately 0.75 miles above the lagoon. A creel census was conducted to gain angler harvest and age and size data from chinook and steelhead.

Gabions were used to construct the fishery enhancement structures on Island Lake Creek and Roadside Creek. The Fisheries Rehabilitation Enhancement and Development Division and the Department of Highways assisted with the former and latter projects, respectively.

Bottom samples from Mayflower Lake were collected with a 9x9" Ekman dredge.

FINDINGS

Results

Lake and Stream Surveys:

Volumetric surveys of Tanignak and Pony lakes (Figure 2) indicate respective surface areas of 29.5 and 14.4 acres, maximum depths of 22 and 11 feet, and

PLEASE DETACH AND MAIL IMMEDIATELY - PRIOR TO NOV. 30

I -did/did not- fish for salmon. I -did/did not- fish for Dolly Varden

I -did/did not- fish for halibut. I -did/did not- fish for steelhead.

Area Fished	No. Times Fished	Total No. Fish Retained						
		Pink	Dog	Silver	Dolly Varden	Red	King	Steelhead
American R.	_____	_____	_____	_____	_____			
Buskin R.	_____	_____	_____	_____	_____	_____		
Kalsin R.	_____	_____	_____	_____	_____			
Olds R.	_____	_____	_____	_____	_____			
Pasagshak R.	_____	_____	_____	_____	_____	_____		
Roslyn Cr.	_____	_____	_____	_____	_____			
Saltery Cr.	_____	_____	_____	_____	_____			
Salonie Cr.	_____	_____	_____	_____	_____			
Other:								
Stream _____	_____	_____	_____	_____	_____	_____	_____	_____
Stream _____	_____	_____	_____	_____	_____	_____	_____	_____
Stream _____	_____	_____	_____	_____	_____	_____	_____	_____
Saltwater Beach	_____	_____	_____	_____	_____	_____	_____	_____

Number of times fished for halibut _____. Number of halibut retained ____.

Any comments or recommendations you have regarding the Kodiak Sport
Fishery would be appreciated: _____

Figure 1. Fall Postal Questionnaire, 1975.

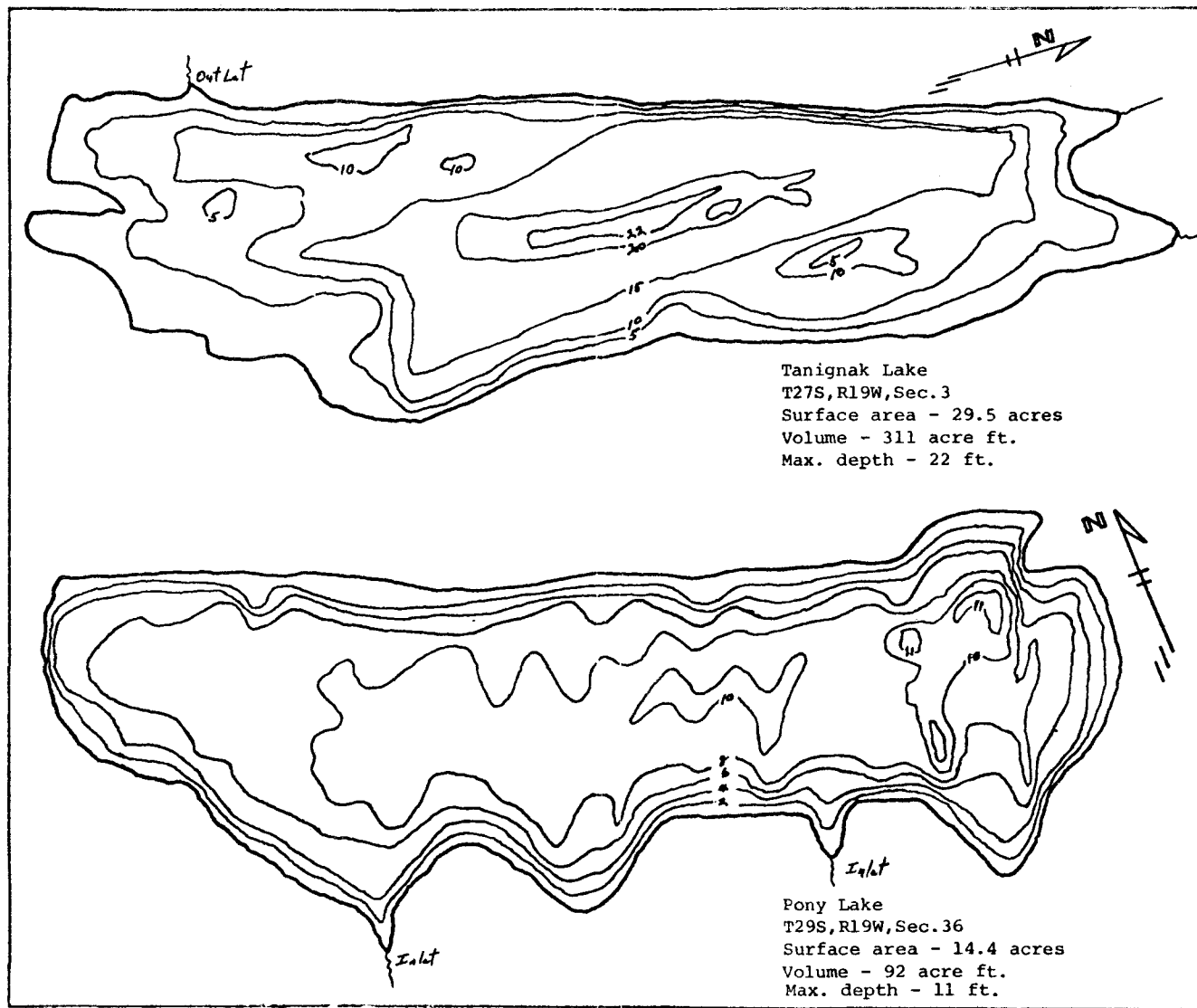


Figure 2. Volumetric Maps of Tanignak Lake and Pony Lake.

volumes of 311 and 92 acre feet. These lakes contain threespine stickleback, Gasterosteus aculeatus (Linnaeus) and are being considered for chemical rehabilitation.

Investigation of 30 unsurveyed streams on Shuyak Island (Figure 3) indicated streams 5, 11, 16, 17, and 18 contained anadromous fish. The remaining waters were either intermittent or contained too steep a gradient for fish production. (A complete report of the Shuyak survey is on file in the Kodiak office.)

The 10 timber cut units (total = 1,099 acres) on Afognak Island (Figure 4) were found to contain 16 fish producing streams (total stream length of 17.5 miles) and 10 major streams crossed by logging related activities which required culvert or bridge installations.

Relative growth and survival rates of stocked and/or wild fish in 27 Kodiak lakes as determined by test netting is presented in Table 1.

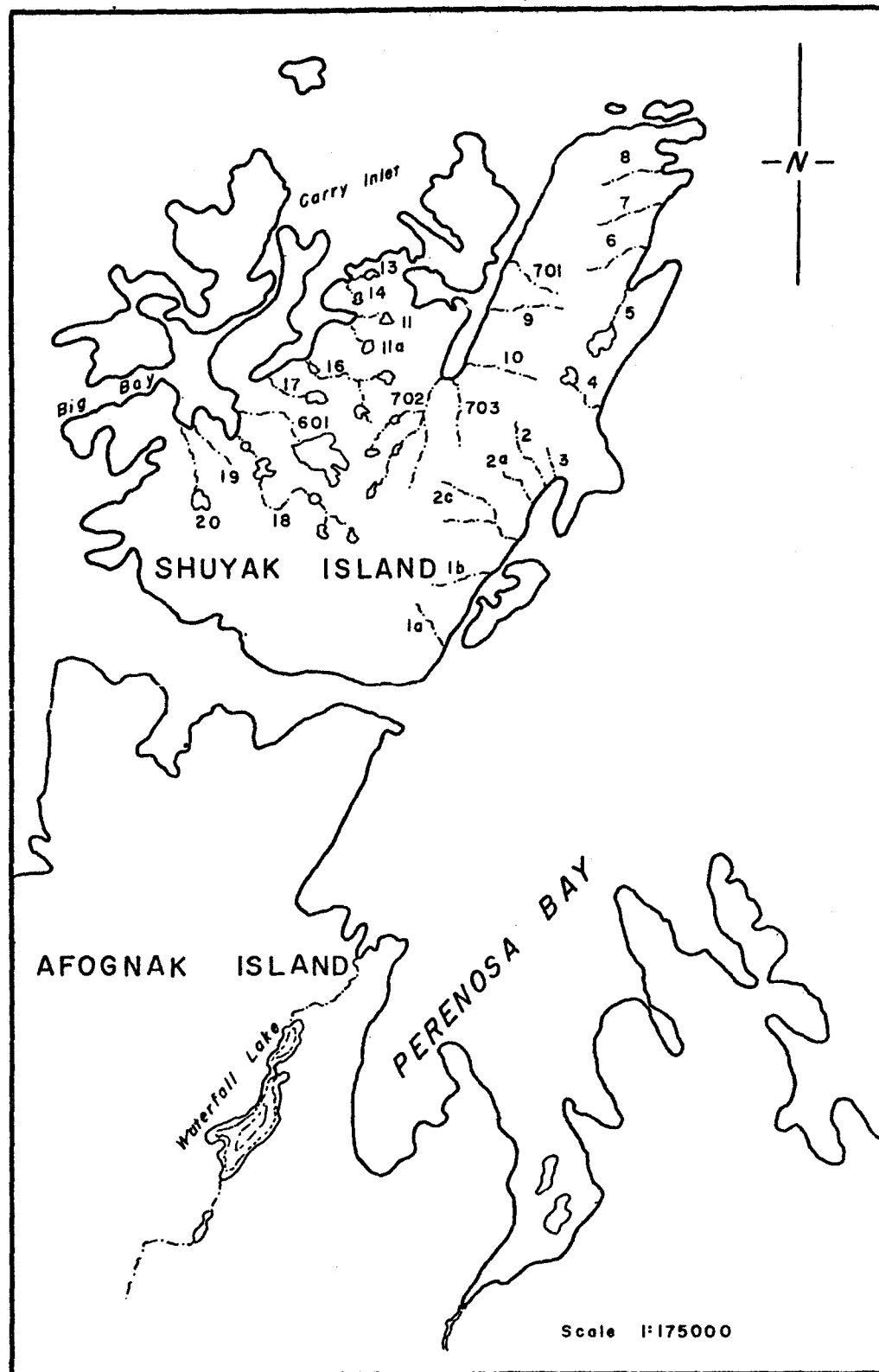


FIGURE 3. Streams Surveyed on Shuyak Island.

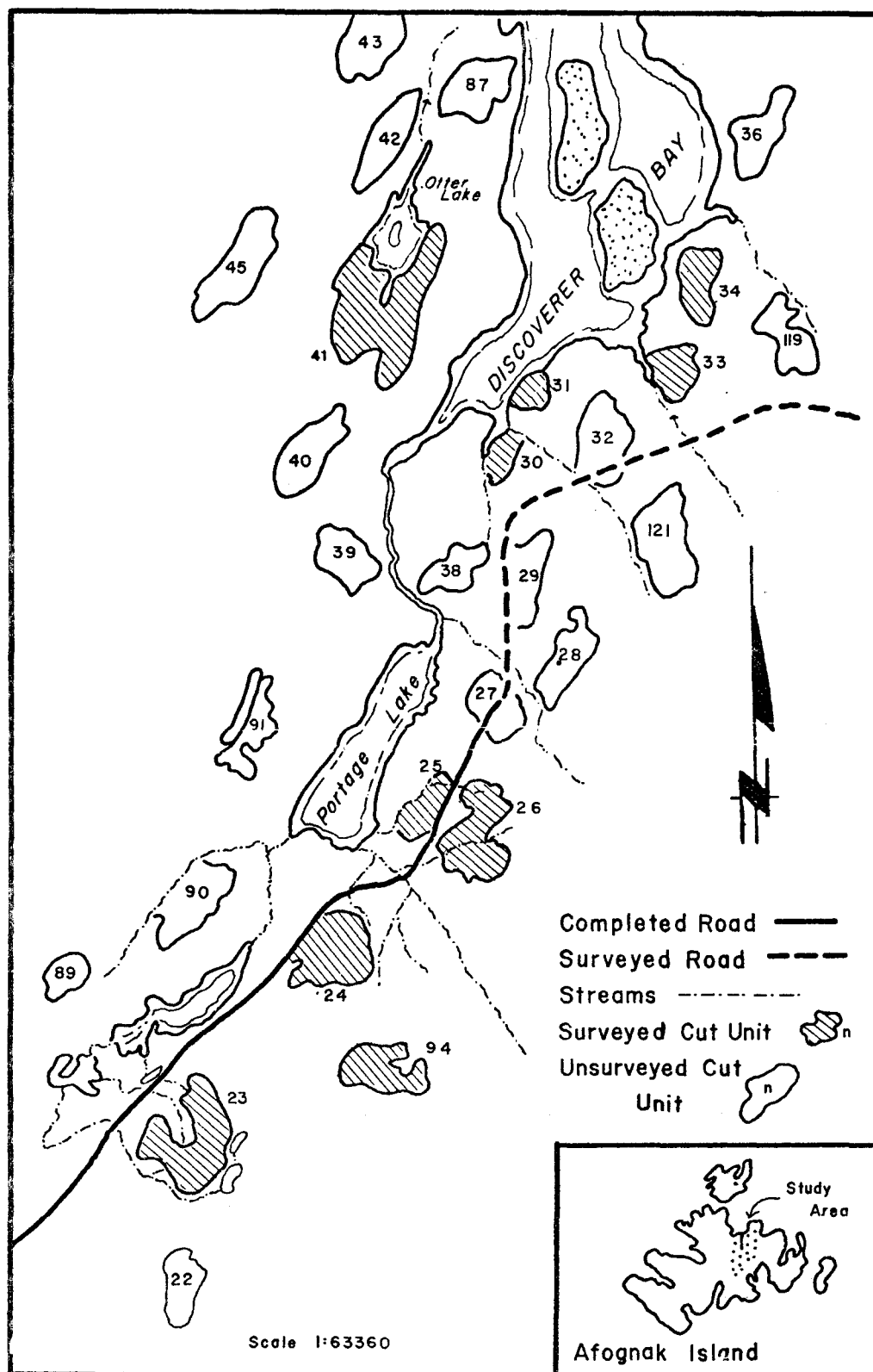


FIGURE 4. Location of Clear Cut Logging Units on Afognak Island.

Table 1. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data									History			
	Date Sampled	Species *	Number	Age Class	Length (mm)		Weight (gr)		Catch/ Net Hr.	Date ** Stocked	Total Number	Per lb.	Per Acre
Abercrombie T27S, R19W Sec. 15	9/17	GR	38	II	168-245	197	56-150	92	2.62	6/16/73	55,000	Fry	2,941
		RT	7	I	172-208	190	60-116	89	0.48	6/20/74	3,700	1,449	198
		RT	2	II	222-245	234	158-190	174	0.14	7/9/73	3,625	261	194
Aurel T28S, R21W Sec. 36	8/16	GR	5	III	267-285	275	210-267	232	0.04	NR or migrants from Cicely Lake			
	8/22	GR	5	IV	319-360	341	396-498	452	0.04	NR			
		RT	2	0	91-107	99	21-28	24	0.01	7/8/75	1,500	267	100
		RT	3	I	178-218	198	82-99	90	0.02	6/20/74	3,000	1,449	200
		RT	1	III	325		419		0.01	NR			
		RT	2	IV	417-421	419	653-940	797	0.01	7/27/71	3,000	306	200
Barry Lagoon T31S, R19W Sec. 28	9/3	SS	7	I	164-189	176	46-63	53	0.16	6/20/74	20,000	1,145	84
		SS	4	II	227-300	262	119-352	229	0.09	6/22/73	39,720	518	167
		SS	4	III	356-400	384	624-1078	823	0.09	NR			
		DV	28	II	170-214	193	46-76	65	0.64	NR			
		DV	5	III	221-262	241	104-156	123	0.12	NR			
		DV	4	IV	283-310	297	190-368	270	0.09	NR			
		CT	1	***	286				0.03	Ocean Migrant			

Table 1. contd. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data								History				
	Date Sampled	Species*	Number	Age Class	Length (mm) Range Mean		Weight (gr) Range Mean		Catch/ Net Hr.	Date ** Stocked	Total Number	Per lb.	Per Acre
Bull T31S, R20W Sec. 35	9/3	RT	9	O	96-123	108			0.20	7/8/75	1,500	1,807	151
		RT (W)	19	I	172-286	230	72-303	166	0.42	6/20/74	3,000	1,449	302
Caroline T28S, R21W Sec. 26	8/16		0			70.25 Net hours			0.00				
Cascade T27S, R21W Sec. 12	7/30	GR	19	I	114-165	133	14-43	24	0.21	NR, 1974			
		GR	9	II	211-257	236	93-175	161	0.10	NR, 1973			
		GR	3	III	283-296	288	256-285	268	0.03	NR, 1972			
		RT	7	I	80-98	92	7-11	10	0.08	NR, 1974			
		RT	3	II	194-255	223	91-210	146	0.03	NR, 1973			
		RT	3	III	310-340	321	345-465	386	0.03	NR, 1972			
		RT	2	V	383-404	393	647-770	708	0.02	NR, 1970			
Chiniak Lagoon T29S, R19W Sec. 34	9/10	DV	1	II	197		79		0.02	NR, 1973			
		DV	13	III	205-285	242	102-275	167	0.27	NR, 1972			
		DV	8	IV	310-355	331	296-568	421	0.16	NR, 1971			
		DV	4	V	339-384	362	452-544	505	0.08	NR, 1970			

Table 1. contd. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data							History					
	Date Sampled	Species *	Number	Age Class	Length (mm) Range Mean		Weight (gr) Range Mean		Catch/ Net Hr.	Date ** Stocked	Total Number	Per lb.	Per Acre
Cicely T28S, R21W Sec. 36	8/22	RT	1	I	155		76		0.02	NR or Migrants from Aurel			
		RT	1	II	275		280		0.02	" "	" "	" "	
		GR	3	III	271-325	302	219-440	342	0.04	7/3/72	10,000	Fry	1,786
Dolgoi T28S, R19W Sec. 12	8/28	DV	2	I	110-115	112	17-17	17	0.02	NR, 1974			
		DV	1	II	259		200		0.01	NR, 1973			
		DV	4	III	373-380	378	539-568	561	0.04	NR, 1972			
		RT	4	III	340-422	388	524-1702	926	0.04	NR, 1972			
Dragonfly T28S, R24W Sec. 34	8/7	DV	1	II	190		78		0.01	NR, 1973			
		RT	16	I	135-190	168	46-96	72	0.18	6/24/74	1,600	150	210
		RT	15	II	200-286	224	94-290	151	0.16	6/21/73	1,600	155	210
Genevieve T28S, R20W Sec. 10	8/1	DV	5	II	150-162	156	40-48	45	0.06	NR, 1973			
		RS	2	II	147-150	148	34-44	39	0.02	NR, 1973			
		RT (W)	31	I	126-170	148	27-65	43	0.35	6/20/74	9,500	1,449	202
		RT (W)	4	II	190-233	213	86-155	130	0.04	6/20/73	10,200	266	217

Table 1. contd. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data								History				
	Date Sampled	* Species	Number	Age Class	Length (mm)		Weight (gr)		Catch/ Net Hr.	Date ** Stocked	Total Number	Per lb.	Per Acre
					Range	Mean	Range	Mean					
Heitman T29S, R20W Sec. 05	9/7	RT	6	I	154-212	187	41-127	67	0.15	NR, 1974			
		RT	1	II	182		72		0.02	NR, 1973			
Horseshoe T28S, R20W Sec. 35	9/9	RT	7	0	90-112	100	10-17	13	0.26	7/18/75	1,600	267	333
		RT	17	I	139-198	180	40-108	80	0.64	6/21/74	1,600	1,449	333
Jack T28S, R21W Sec. 36	8/5	RT	3	I	190-213	205	96-136	120	0.15	6/20/74	900	1,499	191
		RT	3	II	235-302	274	144-369	282	0.15	6/21/73	900	155	191
		RT	2	III	312-315	314	398-438	418	0.10	8/11/72	900	556	191
Jupiter T30S, R21W Sec. 18	9/18	RT	7	I	187-255	222	90-225	151	0.14	6/21/74	3,600	1,449	200
		RT	2	II	216-335	276	126-495	310	0.04	6/21/73	3,600	155	206
		RT	6	III	313-394	338	388-775	488	0.12	8/11/72	3,600	556	206
Lee T28S, R21W Sec. 36	8/7	DV	1	II	235		145		0.02	NR, 1973			
		DV	1	III	233		150		0.02	NR, 1972			
		RT	1	I	110		134		0.02	6/24/74	2,800	1,449	196
		RT	3	II	228-281	257	142-294	240	0.04	7/9/73	2,800	155	196
		RT	4	III	344-369	361	545-812	636	0.06	8/11/72	2,800	556	196

Table 1. contd. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data									History			
	Date Sampled	* Species	Number	Age Class	Length (mm)		Weight (gr)		Catch/ Net Hr.	Date ** Stocked	Total Number	Per lb.	Per Acre
Lilly Pond T28S, R20W Sec. 27	7/31	RT	16	I	170-215	184	84-118	92	0.82	6/20/74	2,000		254
Long T27S, R19W Sec. 34	8/26	DV	2	I	118-122	120	19-21	20	0.09	NR, 1974			
		GR	11	I	157-187	174	50-69	60	0.48	7/20/74	1,258	83	35
		RT	15	I	167-241	200	61-180	106	0.65	6/24/74	5,400	1,449	150
Lupine T21S, R20W Sec. 35	9/3	RT (E)	5	0	100-115	106			0.22	7/18/75	750	267	100
		RT (E)	14	I	177-321	271	66-452	283	0.60	6/20/74	1,500	150	200
Margaret T28S, R20W Sec. 11	8/1	RT (W)	41	I	130-172	148	29-67	43	0.59	6/21/74	800	150	101
	8/5	RT (E)	14	I	140-169	152	35-57	44	0.20	6/21/74	800	1,449	101
		RT (E)	5	II	174-241	210	73-192	122	0.07	6/21/73	800	155	101
Mayflower T29S, R20W Sec. 23	9/9	DV	7	***	89-403	282	10-610	241	0.18	NR			
		SS	11	I	95-164	107	10-55	22	0.29	6/20/74	1,500	1,145	121

Table 1. contd. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data								History				
	Date Sampled	* Species	Age Number	Class	Length (mm)		Weight (gr)		Catch/ Net Hr.	Date ** Stocked	Total Number	Per lb.	Per Acre
Orbin T28S, R20W Sec. 31	8/1	DV	1	I	140		31		0.05	NR, 1974			
		DV	2	II	187-232		72-138		0.10	NR, 1973			
		RT	1	I	251		202		0.05	Migrant from Beaver Pond			
		RT	2	III	330-365		402-512		0.10	" " " "			
		SS	3	I	175-187		62-80		0.15	NR, 1974			
Pony T29S, R19W Sec. 36	9/10	SS	6	I	105-200		12-110		0.07	6/20/74	3,000	1,145	210
		SS	4	II	141-182		34-78		0.05	6/23/73	2,800	518	194
Saturn T30S, R18W Sec. 18	9/18	RT	4	III	368-425		334-1020		0.08	8/11/72	2,400	556	205
Snag T28S, R20W Sec. 35	8/7	RT	19	I	130-238		60-174		0.28	6/24/74	1,610	150	322
		RT	3	II	185-210		96-144		0.04	6/21/73	1,500	155	300
Southern T28S, R19W Sec. 14	8/26	SS	49	I	138-196		38-79		1.17	6/20/74	3,300	1,145	189
		SS	14	II	163-221		55-125		0.33	6/26/73	3,000	966	172

Table 1 . contd. Population Characteristics of Kodiak Lakes as Defined by Variable-Mesh Gill Nets, 1975.

Lake Name & Location	Sampling Data								History				
	Date	* Species	Age	Length (mm)		Weight (gr)		Catch/ Net Hr.	Date **	Total Number	Per lb.	Per Acre	
	Sampled	Number	Class	Range	Mean	Range	Mean		Stocked				
Tanignak T27S, R19W Sec. 3	8/28	DV	1	II	290		226		0.01	NR, 1973			
		RT	12	I	141-255	216	38-240	135	0.08	6/20/74	6,500	1,449	218
		RT	27	II	282-343	315	262-466	369	0.19	6/25/73	6,500	155	218
		RT	10	III	318-367	339	390-596	459	0.07	8/11/72	6,500	556	218

* E = Ennis, Montana strain

** NR = Natural Reproduction

W = Winthrop, Washington strain

*** Fish were not aged

DV = Dolly Varden

GR = Grayling

RT = Rainbow Trout

SS = Coho Salmon

RS = Sockeye Salmon

CT = Cottid

Mayflower Lake was inundated by sea water during the 1964 Tsunami (Lall, Marriot, Spetz, and Simons, 1965) and currently remains saline below mid-depth. Salinity readings at 15 and 28 feet on July 10, 1975 were 10 ppt and 16.5 ppt, respectively, identical to those recorded December 12, 1970 (Van Hulle, 1971). Analysis of bottom samples, collected with an Ekman Dredge July 10, 1975, indicated freshwater plant and animal life did not exist in the saltwater strata. Samples collected from depths of 27 and 28 feet contained strong hydrogen sulfide gas odors, characteristic stagnant, mineral water (Table 2).

Table 2. Bottom Sample Analysis from Mayflower Lake, July 10, 1975.

Depth (ft.)	Salinity*	Bottom Type	Aquatic Organisms
3	0	Volcanic ash and fibrous detritus	none
6	0	Volcanic ash and fibrous detritus	diptera larva
9	0	Volcanic ash with pulpy and fibrous detritus	annelids, snails, diptera larva
12	0	Volcanic ash and pulpy detritus	diptera larva
15,18,21,24	10-16	Volcanic ash and pulpy detritus	none
27	16.5	Volcanic ash and pulpy detritus (hydrogen sulfide gas odor)	none
28	16.5	Volcanic ash and pulpy detritus (hydrogen sulfide gas odor)	none

* parts per thousand

Water chemistry data of seven Kodiak Island managed lakes sampled mid-monthly is presented in Table 3. Total alkalinity and total hardness as CaCO_3 and dissolved oxygen ranges were 4-38 ppm, 2-44 ppm, and 7-14 ppm, respectively. The first ice cover did not occur until mid-November and all

Table 3. Water Characteristics of Seven Kodiak Lakes Sampled Monthly, July 15, 1974-June 15, 1975.

Lake	Total Alk.* (ppm)		Total Hard.* (ppm)		pH		Dissolved Oxygen (ppm)		Temp. °C		Freeze	Ice Cover(In.)		Break	Snow Cover(In.)	
	x	Range	x	Range	x	Range	x	Range	x	Range	Up	x	Range	Up	x	Range
Abercrombie	27.9	24-30	34.7	30-44	7.4	6.7-8.2	11.3	8.6-13.5	7.6	1.5-18.5	Mid-Nov.	13.2	1-24	Early May	3.5	1-4
Lupine	23.8	10-38	16.0	6-24	7.2	6.7-8.2	9.7	7-11.5	8.8	1.0-19.0	Mid-Nov.	12.0	1-20	Early May	4.2	4-6
Margaret	19.3	12-26	17.8	10-24	7.1	6.6-7.9	10.8	8.5-12.5	7.2	1.0-20.0	Mid-Nov.	13.2	1-20	Mid-May	6.3	2-14
Bull	16.8	10-24	11.4	9-18	7.1	6.6-7.7	10.8	7.5-13.0	8.0	1.0-19.0	Mid-Nov.	12.1	1-20	Early May	6.8	4-10
Genevieve	13.8	6-20	11.6	6-18	7.0	6.5-7.7	11.8	9.0-14.0	7.4	1.0-19.0	Mid-Nov.	15.6	1-32	Mid-May	6.6	2-15
Lee	12.0	4-16	7.3	2-10	6.9	6.3-7.8	11.6	9.0-13.5	7.1	1.5-21.0	Mid-Nov.	18.5	1-41	Late May	9.4	2-21
Dragonfly	11.7	8-18	7.8	4-10	6.8	6.3-7.4	10.6	7.5-12.0	7.2	1.0-21.0	Mid-Nov.	15.4	1-32	Late May	4.0	1-6

*CaCO₃

of the lakes were ice free by late May. The mean snow and ice cover range was 4.2-9.4 inches and 12.0-18.5 inches, respectively.

Water chemistry analysis of six Kodiak Island managed lakes as determined by the U.S.G.S. Laboratory in Anchorage, Alaska and a DR-EL Hach field kit in Kodiak, Alaska are compared in Table 4. Total alkalinity and total hardness as calcium carbonate (CaCO_3) for any of the waters tested by either method never exceeded 36 ppm. The Hach kit gave slightly higher alkalinity readings (3-16 ppm) and similar to slightly lower (15 ppm) hardness readings.

Table 4. Analysis of Water Samples Collected From Six Kodiak Lakes and Analyzed by U.S.G.S. in Anchorage, Alaska, and the Alaska Department of Fish and Game, with a DR-EL Hach Kit, May 29, 1975.

Lake Name	Total Alkalinity (ppm/ CaCO_3)	Total Hardness (ppm/ CaCO_3)	pH*
Abercrombie			
USGS	27	36	7.0
Hach	36	30	8.0
Bull			
USGS	7	11	6.7
Hach	16	8	7.2
Dragonfly			
USGS	9	7	6.7
Hach	14	8	7.3
Genevieve			
USGS	17	27	6.8
Hach	20	12	7.0
Lee			
USGS	11	7	6.7
Hach	16	6	6.9
Margaret			
USGS	10	16	6.7
Hach	26	12	7.4

*U.S.G.S. did not consider their pH tests to be accurate due to the time lag between sample collection and analysis.

Assessment and Inventory of Anadromous Fish Populations:

Harvest estimates from Buskin River creel census (April 22-October 19) and a Kodiak area postal survey are currently under statistical analysis and not available for reporting. However, inspection of raw census data indicates the Dolly Varden fishery extended from May 4-June 1. A sample of 671 angler caught Dolly Varden averaged 307 mm in length with a range of 193-520 mm. The mean length of fish sampled became progressively smaller as the outmigration continued (Figure 5).

Age and growth data of 128 angler caught Buskin River coho (Table 5) indicate age classes 2.1, 1.1, and 3.1 respectively, comprised 87.7%, 9.0%, and 3.3% of the sample. Age 2.1 males (n=41) averaged 702 mm and 11.5 lb. and 2.1 females (n=43) averaged 679 mm and 10.0 lb.

A survey of Lake Rose Tead indicated the best spawning areas are the inlet streams, a lake-side gravel pit, and the southeast shore. The outlet (Pasagshak River) is composed of sand and silt and not suitable for spawning. Table 6 presents harvest and escapement estimates of Lake Rose Tead coho from 1965-1975.

A minimum of 4,207 sockeye salmon, O. nerka (Walbaum), 193,320 pink salmon, O. gorbuscha (Walbaum), 12,150 chum salmon, O. keta (Walbaum), and 5,820 coho spawned in 20 northeastern Kodiak Island streams during 1975 (Table 7).

Pink salmon numbers were low in Marshy, Chiniak, and Salt creeks, while chum escapements were low in the American and Olds rivers. Monashka, Pillar and Salt creeks, had low coho escapements.

Sport harvest and effort in the vicinity of Commercial Fish Division weirs at Karluk Lake and Lagoon, Ayakulik River, Akalura Creek, and Olga Creek, are presented in Table 8. Most fishing pressure occurred on Karluk River where a minimum of 310 anglers fished 881 days. Angler effort on Akalura, Ayakulik and Olga creeks was 31, 94, and 8 angler days, respectively. Fishing in the above waters was excellent with large numbers of fish released in relation to the total harvest (Table 8).

Scale samples were collected from 29 Karluk River steelhead during June, 1975; however, only 16 fish had readable scales. Age analysis of the small sample indicated six age classes were represented in four brood years (1966, 1968, 1969, and 1970) with 1969 and 1970 parent stock producing 43.5% and 37.23%, respectively, of the sample.

Chinook salmon, O. tshawytscha (Walbaum), (n=92) sampled at Karluk Lagoon were composed of six age classes with parent years 1969, 1970, and 1971 producing 88.1% of the sample (Table 9). Age 1.4 females averaged 883 mm (n=13) in length, 20 mm longer than 1.4 males (n=10).

A total of 1,564 chinook salmon were enumerated in Karluk River on an August 20-21 float survey. Since the river's breadth (200-400 feet) prevents total fish enumeration, it is estimated a minimum of 2,000 chinook spawned in Karluk River during 1975.

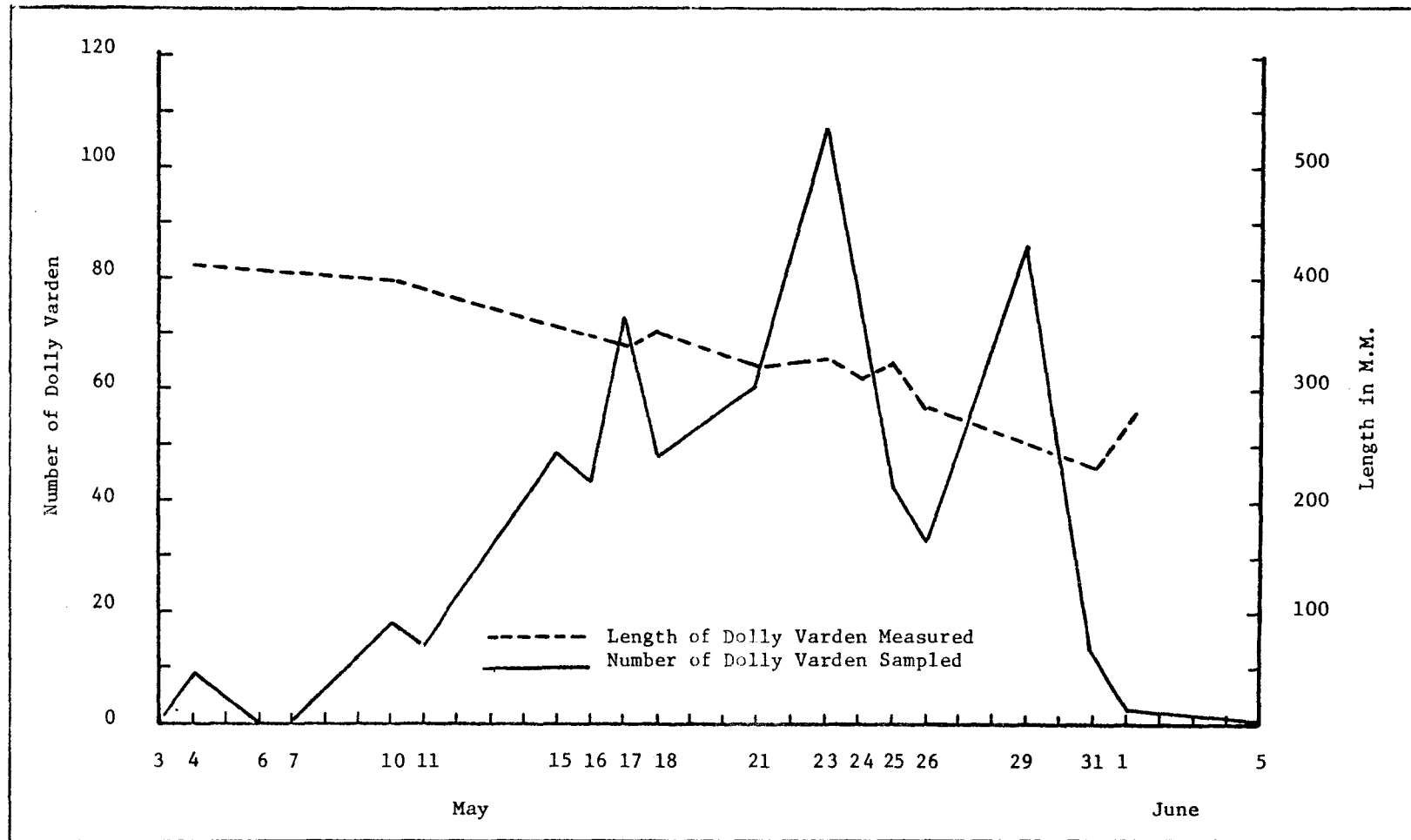


FIGURE 5. Number and Mean Length of Buskin River Dolly Varden Sampled from Angler Creels, May, 1975.

Table 5. Size and Age Composition of Buskin River Coho Salmon, 1975.

	Age	n Aged	Brood Year	Ln Rge	\bar{x} Ln	Wt Rge	\bar{x} Wt	n * Sampled	%
<u>Males</u>									
Round	2.0	12	1972	335-397	332	1.2-2.0	1.9	12	16.9
	1.1	4	1972	596-712	679	5.8-9.8	7.8	4	5.6
	2.1	41	1971	560-806	702	7.2-15.0	11.5	41	57.8
	3.1	1	1970	800				1	1.4
Dressed	1.1	1	1972	736		13.2		3	4.2
	2.1	<u>7</u>	1971	<u>687-760</u>	<u>727</u>	<u>7.8-13.0</u>	<u>9.8</u>	<u>10</u>	<u>14.1</u>
Total**		66		560-806	706	5.8-15.0	10.4	71	100.0
<u>Females</u>									
Round	1.1	1	1972	740 mm		11.8		1	1.6
	2.1	43	1971	525-780	679	3.8-15.0	10.0	43	68.2
	3.1	3	1970	680-707	696			3	4.8
Dressed	1.1	3	1972	Incomplete Data				3	4.8
	2.1	<u>12</u>	1971	<u>670-750</u>	<u>704</u>	<u>7.0-8.8</u>	<u>7.8</u>	<u>13</u>	<u>20.6</u>
Total***		62		525-780	686	3.8-15.0	10.0	63	100.0
Age Class Composition Excluding Jacks									
	<u>Age</u>	<u>1.1</u>	<u>2.1</u>	<u>3.1</u>	<u>Total</u>				
	<u>No.</u>	11	107	4	122				
	<u>%</u>	9.0	87.7	3.3	100.0				
	<u>Brood Year</u>	1972	1971	1970					

* Difference between "sampled" and "aged" are incomplete size data

** Excludes size data for age 2.0 and weight data for dressed fish

*** Excludes weight data for dressed fish

Table 6. Harvest and Escapement Estimates of Lake Rose Tead Coho Salmon, 1965-1975.

Year	Escapement	Sport Harvest	Total Run
1965	250	*	*
1966	1,600	200	1,800
1967	2,600	200	2,800
1968	3,500	300	3,800
1969	2,000	750	2,750
1970	1,000	1,000	2,000
1971	1,050	1,350	2,400
1972	2,800	1,400	4,200
1973	2,350	1,129	3,479
1974	*	609	*
1975	3,500	**	**

* No estimate.

** Estimate pending analysis of postal survey data.

Table 7. Salmon Escapement Estimates, N.E. Kodiak Island, 1975.

System	Sockeye Salmon		Pink Salmon		Chum Salmon		Coho Salmon	
	Date	Escpmt.	Date	Escpmt.	Date	Escpmt.	Date	Escpmt.
American			9-2	28,000***	9-2	700***	10-24	350*
Buskin	8-27	3,207*,**	9-4	22,000***		NA	10-27	500*,**
Chiniak			8-20	1,300***		NA	10-31	150*
Hurst			8-14	6,600***	8-14	1,200***		NC
Kalsin			8-13	400***	8-13	300***	10-24	60*
Marshy			8-20	0***		NA		NC
Monashka			8-7	2,500***		NA	10-14	15*
Myrtle			8-20	3,200***		NA		NC
Olds			8-13	36,000***		200***	10-24	350*
Pasagshak	8-20	1,000***		NC		NA	10-26	3,500*,**
Pillar			9-4	4,500***		NA	10-14	20*
Red Cloud			9-4	2,650***		NC		NA
Roslyn			8-20	5,600***		NA	10-9	160*
Russian			9-4	6,000***	9-4	6,000***	10-29	50*
Salonie			8-20	11,250***	8-20	3,750***	10-29	350*
Salt			8-20	20***		NA	10-24	15*
Saltery		NC	8-20	46,000***		NC		NC
Sargent			8-20	5,000***		NC	10-29	300*
Twin			8-20	300***		NA		NC
#410			9-4	12,000***		NA		NA
Total		4,207		193,320		12,150		5,820

* Foot Survey

NC No Count

NA Not Applicable

** Boat Survey

*** Aerial Survey (Conducted by Commercial Fish Personnel)

Table 8. Creel Census Estimates From Akalura Creek, Ayakulik River, Karluk River and Olga Creek, 1975.

Area	Number of Anglers	Total Days	Total Hours	Steelhead		Rainbow Trout		Dolly Varden		Coho		Chinook		Sockeye	
				Released	Retained	Released	Retained	Released	Retained	Released	Retained	Released	Retained	Released	Retained
Akalura Cr.	31	31		2	1	62	7	20	4	1	1			3	6
Ayakulik R.	17	94	523	125	11	0	0	121	14	11	3	69	12	75	102
Karluk R.															
Lake	45	133	653	1	0	9	21	52	51	0	0	9	0	12	14
Portage*	177	485	1579	48	20	10	10	101	25	0	0	61	165	40	16
Portage**	45	149	1102	1344	42	0	0	755	126	227	14	0	0	0	0
Lagoon	43	114	991	118	27	0	9	50	0	0	0	75	100	2	2
Total	310	881	4325	1511	89	19	40	958	202	227	14	145	265	54	32
Olga Cr.:	5	8		0	0	12	6	28	2	21	8			4	0

* Summer, June--August 15, (minimum estimate based on 1972 creel census data)

** Fall, October--November 15.

Table 9. Age and Length Composition of Chinook Salmon Sampled at Karluk Lagoon, June and July, 1975.

	Age	Brood Year	No.	% Total	Length (mm)	
					Range	Mean
Male:	2.4	1968	1	2.7	900	
	1.4	1969	10	27.0	710-900	863
	2.2	1970	1	2.7	690	
	1.3	1970	6	16.2	670-840	770
	1.2	1971	15	40.6	530-830	607
	1.1	1972	3	8.1	360-420	393
	1.0	1973	<u>1</u>	<u>2.7</u>	360	
			37	100.0		
Female:	2.4	1968	2	10.0	760-910	835
	1.5	1968	1	5.0	910	
	1.4	1969	13	65.0	825-1050	883
	1.3	1970	2	10.0	790-840	815
	1.2	1971	<u>2</u>	<u>10.0</u>		
			20	100.0		
Number and % Total (All Fish Sampled)	2.4	1968	5	5.4		
	1.5	1968	1	1.1		
	1.4	1969	32	34.8		
	2.3	1969	1	1.1		
	2.2	1970	1	1.1		
	1.3	1970	22	23.9		
	1.2	1971	25	27.2		
	1.1	1972	4	4.3		
	1.0	1973	<u>1</u>	<u>1.1</u>		
			92	100.0		

A total of 97 king salmon were sampled; however, five scale samples were unreadable and sex was not determined for 35 fish.

From May 24-August 23, a total of 1,053 chinook salmon were enumerated through Ayakulik weir. Chinook began moving through the weir five days after installation and continued until ten days prior to closure.

Gill Net Catch Analysis:

Figure 6 shows the mean length of trout captured by respective net panel of variable mesh gill nets. The mean length of fish captured increased as mesh sizes became larger. Figure 7 shows distribution of the rainbow trout sample by age class. The catch taken by the 3/4-inch and 1-inch net panels captured ages I and II fish, respectively. However, there was some overlap of age class from the panels indicated, that is, there were some age II with the age I fish in the 3/4-inch mesh panel and some age I with the age II fish in the 1-inch mesh panel.

Bilateral sampling by 3/4 and 1-inch meshes was also observed for Dolly Varden, grayling and coho, however, the small samples described in Table 10 preclude reliable conclusions.

Enhancement and Development of Anadromous Fish:

The gabions installed in Island Lake Creek created a pool facilitating fish passage over the falls and into Island Lake (Figure 8).

Gabions installed in Roadside Creek diverted stream flow to Near Spring (Lake Rose Tead tributaries) creating approximately 12,800 square yards of additional spawning and rearing area (Figure 9).

Mission Lake was experimentally stocked with 3,700 coho (518/lb.) June 27, 1973. On October 1, 1975 coho were observed off the outlet where 23 fish were captured and transferred to the lake. During the flood tide 12 coho negotiated the tide gate into the lake during a 20-minute observation period. Total escapement into the lake was not determined due to icing conditions and poor visibility, however, the plant produced a very active sport fishery as evidenced by 35 anglers (instantaneous count) fishing the Mission Beach area on October 7.

Public Access to Sport Fishing Waters:

Easement recommendations across lands in the Kodiak area (Figure 10) selected by natives under the ANCSA were submitted to the Habitat Protection section for final action by the Bureau of Land Management.

Discussion

Lake and Stream Surveys:

The following recommendations were made to the U.S.F.S. regarding logging operations near streams on Afognak Island (Figure 4): (1) no yarding across streams; (2) trees will not be felled into streams; (3) trees accidentally felled in the stream should be removed within 24 hours; (4) culverts installed so as not to impede fish movement; (5) construct bridges across major streams; (6) equipment will not operate in streams; (7) a fringe of wind firm timber be left along major waters; (8) orient road-stream cross-cross

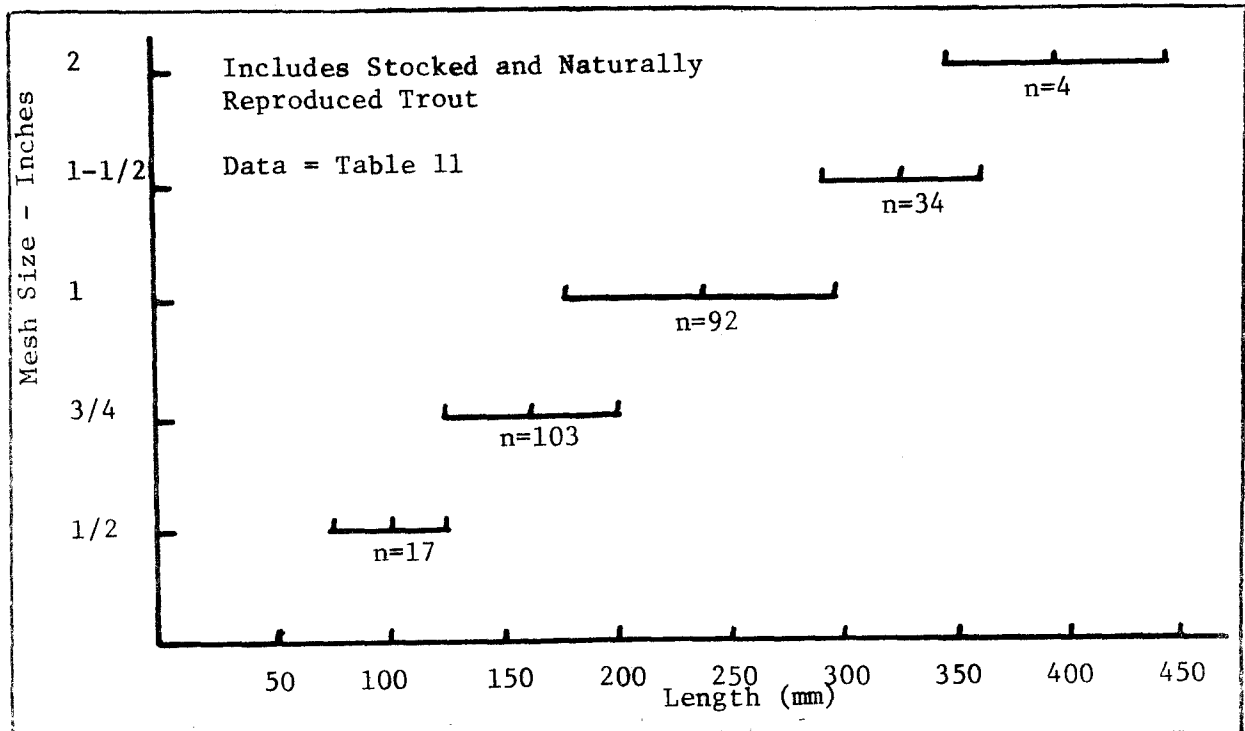


Figure 6. Mean Size and Standard Deviation of Rainbow Trout Caught by Different Mesh Sizes of Variable Mesh Gill Net, Kodiak Island.

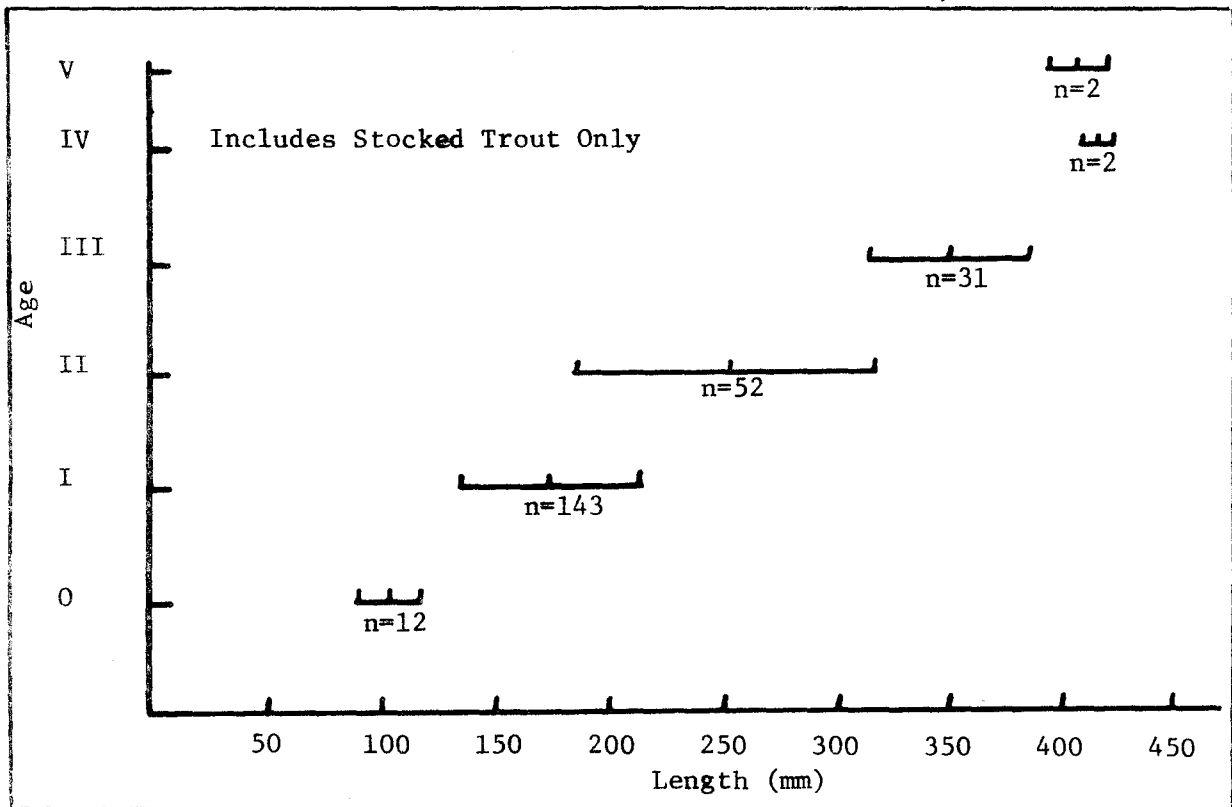


Figure 7. Mean Length and Standard Deviation of Various Rainbow Trout Age Classes Caught by a Variable Mesh Gill Net, Kodiak Island.

Table 10. Fish by Size, Species and Net Panel Captured in Variable Mesh Gill Nets Kodiak Island, 1975.

	MESH SIZE									
	1/2"		3/4"		1"		1-1/2"		2"	
	Ln*	Wt**	Ln*	Wt**	Ln*	Wt**	Ln*	Wt**	Ln*	Wt**
Grayling										
n	17	17	6	6	10	10	6	6	3	3
\bar{x}	126	20	194	98	249	170	276	281	345	464
s.d.	2.7	1.6	58.1	90.6	24.4	53.3	35.6	60.6	17.2	48.3
Rainbow Trout										
n	17	17	103	103	92	92	34	34	4	3
\bar{x}	102	22	165	71.1	242	208	329	458	396	670
s.d.	24.4	28.3	38.1	71.5	60.3	180.3	34.1	144.9	47.5	261.9
Coho Salmon										
n	9	9	81	81	8	8	3	3	0	0
\bar{x}	111	20	176	77	211	201	288	370		
s.d.	28.6	22.5	40.3	108.2	78.4	355.5	91.3	394.7		
Dolly Varden										
n	3	3	28	28	36	36	20	20	2	2
\bar{x}	105	15	192	75	240	170	311	336	338	456
s.d.	13.8	4.0	25.1	35.2	58.9	139.2	56.4	177.8	39.6	124.5

* Ln. is in millimeters

** Wt. is in grams



Figure 8. Waterfall Forms a Pool Below at Lake Creek Falls.

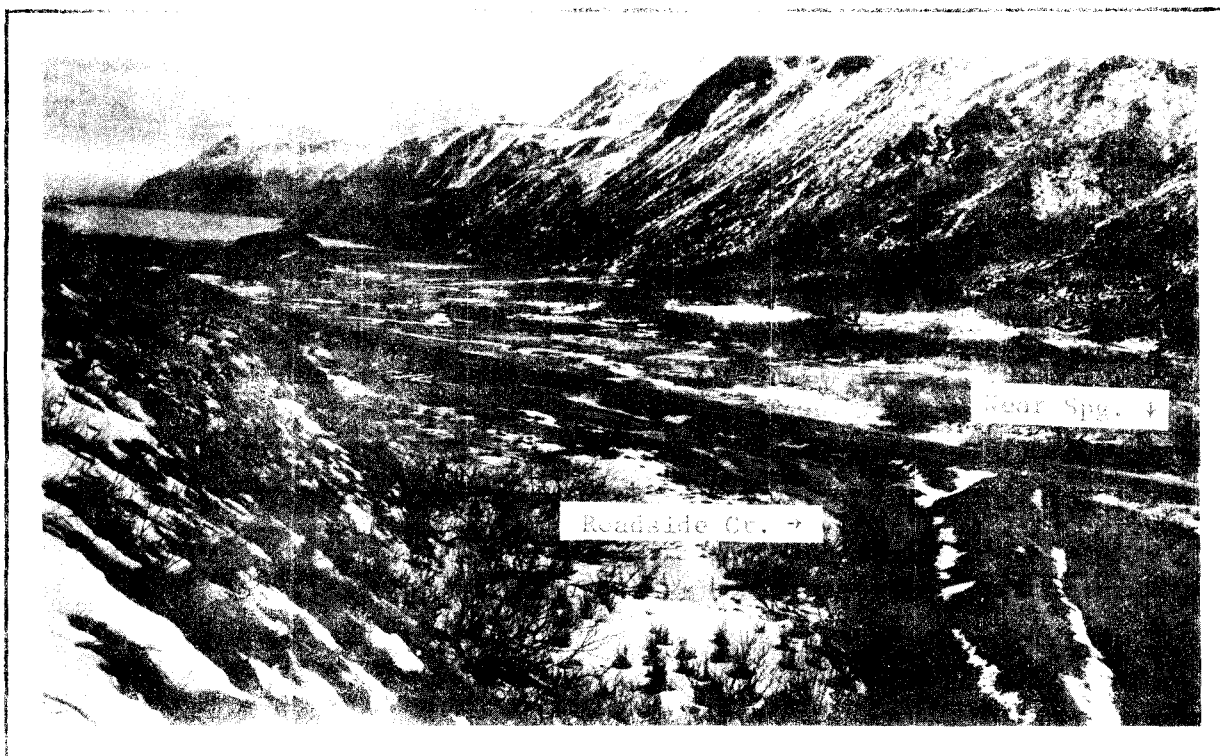


Figure 9. River Flows Over Roadside Creek Into Near Spring

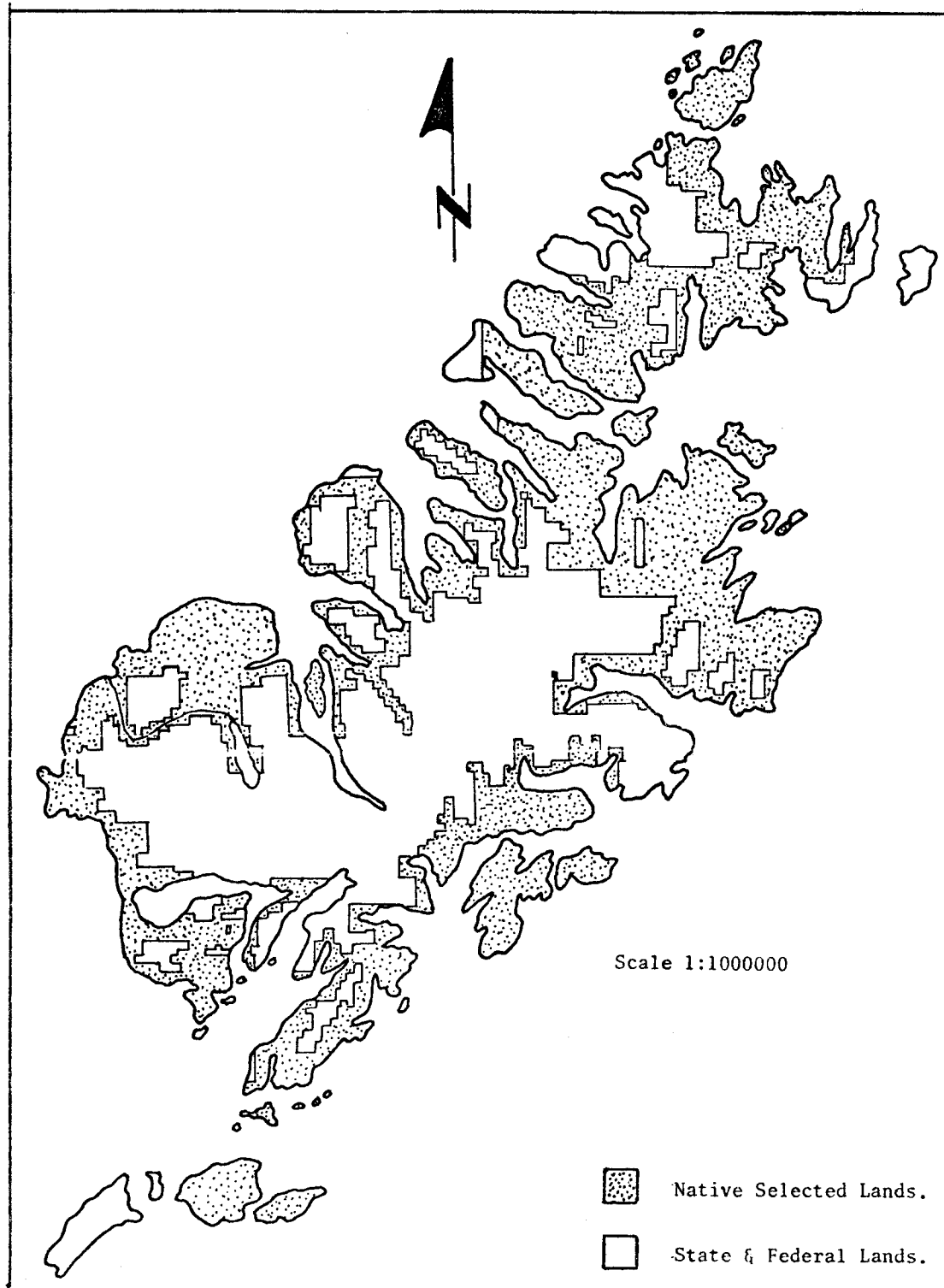


Figure 10. Approximate Area of Native Village Corporations Land Selections in The Kodiak Island Area.

ings at right angles; (9) road crossings be made at headwaters where possible; and (10) utilize natural rock out-croppings for bridge abutments where possible.

Stream surveys of Shuyak Island indicated coho salmon production was distributed throughout the island, and no one watershed was considered to be a major salmon producer. Fishing in most bays is excellent during August and September; however, utilization is low due to the island's remoteness.

Analysis of test netting data (Table 1) suggests growth and survival rates of stocked fishes in most area lakes are adequate to produce viable sport fisheries. Aurel, Cascade, and Tanignak lakes appear to have the best fish populations as several age classes were represented in each sample. In lakes stocked with multiple species, (Abercrombie, Aurel, and Cascade) grayling and rainbow trout appear to compete successfully; however, grayling have a greater growth rate through age I. Both species obtained similar sizes by age II. At age III rainbow are larger than grayling and remain larger through the following age classes.

Landlocked coho production in Mayflower Lake is limited due to stickleback and Dolly Varden competition and a salinity gradient at the 14-foot level which has destroyed approximately one-half the freshwater benthic community (Table 2). The salt water, which has stabilized, must be removed prior to chemical rehabilitation; however, further studies are necessary to determine the feasibility of extracting the saline water.

Poor coho growth and survival in Pony Lake is due to competition with three-spine stickleback. This lake is scheduled for chemical rehabilitation.

Excellent growth rates were observed for age I+ Ennis, Montana rainbow trout in Lupine Lake and Winthrop, Washington trout in Bull Lake. The larger Ennis fry, stocked June 22, 1974 at 150/lb., averaged 271 mm (n=14) in 1975, while Winthrop fry, concurrently stocked at 1,449/lb., average 230 mm (n=19).

Equal numbers of Ennis and Winthrop trout stocked in Margaret Lake at 150 and 1,449 fish per pound June 21, 1974, respectively, averaged 152 mm (n=14) and 148 mm (n=41) in length during 1975 sampling. Similar growth was observed for age I+ Winthrop rainbow trout stocked and sampled concurrently in Lake Genevieve (x=148 mm, n=31). Comparable growth rates for age I fish in the above waters were noted in 1974 (Van Hulle & Murray, 1974) suggesting no appreciable advantage in stocking rehabilitated waters with large fry.

Water chemistry data of seven lakes listed in Table 3 indicate Kodiak waters exhibit low alkalinity and hardness levels and sufficient dissolved oxygen to sustain fish life throughout the year. These conditions are conducive to fish survival, but poor growth as nutrient content of the water is low. Low ice and snow cover, combined with the late fall freezing and mid-spring breakup, reflect the mild winters of Kodiak Island.

Similar water chemistry findings concurrently analyzed by the United States Geological Survey laboratory and a Hach field kit reflect the reliability of the kit and the low productivity of Kodiak area lakes.

The Pasagshak River system supports the largest coho fishery on Kodiak Island. During the 1964 earthquake Lake Rose Tead subsided five feet, causing a reverse river current on 5.5+ foot tides (Lall, Marriot, Simon, Spetz, 1965). The existing salinities appear ideal for coho production as the run has increased tenfold since 1964 (Table 6). For the first time, shoal spawners (n=450) were observed on the southeast shore, suggesting the inlets were at maximum spawning capacity.

The multiple age classes and repeat steelhead-rainbow trout spawners sampled during June, 1975 concur with 1974 fall sampling data (Van Hulle and Murray, 1974) suggesting the Karluk River steelhead run is in excellent condition.

Karluk River salmon escapement counts have been made near the lake outlet since 1945 (Meyer, 1945) where only lake bound fish are enumerated. When the lagoon facility is completely operational, counts of all fish entering the river will be possible. Also, angler effort and harvest for lagoon and float trip fishermen will be determined.

Gillnet Catch Analysis:

Gillnetting is conducted in Kodiak management lakes to determine relative growth and survival rates of age I, II, and III fishes, as they contribute most to the sport fishery. Since it is not necessary or desirable to sample other age classes, a net constructed of 3/4, 1, and 1-1/2 inch mesh would be well suited for sampling stocked lakes in the Kodiak waters.

Enhancement and Development of Anadromous Fish:

The Island Lake Creek enhancement structure should increase anadromous fish escapements into Island Lake as fish are less susceptible to poaching as they can negotiate the falls without injury. During August and September only one coho salmon was observed below the falls while several "jumpers" were observed in the lake, suggesting fish moved past the barrier rapidly.

The diversion structure on Roadside Creek and Near Spring should increase egg survival as prime spawning areas now have continuous water flow. Before the diversion, Roadside Creek and Near Spring were partially dewatered at low flow. This year, a minimum of 1,600 coho utilized the enhanced stream (400 above the deflection) and egg survival is expected to be high. If freshwater and marine survival is adequate, Lake Rose Tead could receive a record coho run in 1978.

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